



Patent
Attorney's Docket No. 018976-203

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of)

Ryoichi MORIMOTO et al.)

Application No.: 09/973,822)

Filed: October 11, 2001)

For: CONNECTION METHOD AND)
CONNECTION STRUCTURE OF)
PAD ELECTRODES, AND)
INSPECTING METHODS FOR)
CONNECTION STATE THEREOF)

Group Art Unit: 2827

Examiner: Ishwarbhai B. Patil

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AMENDMENT UNDER 37 C.F.R. § 1.111

Assistant Commissioner for Patents
Washington, D.C. 20231

Date: April 24, 2002

Sir:

This amendment responds to the Office Action dated January 24, 2002 (Paper No.

2). Concurrently filed this amendment are a Request for Approval of Drawing Changes and an Information Disclosure Statement. Please amend the above-noted application as follows:

IN THE CLAIMS:

Please replace claim 7 as follows.

7. (Amended) A connection structure comprising:

a substrate having a surface and substrate-side pad electrodes formed on the substrate surface;

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a surface-mount component having a surface, component-side pad electrodes formed on the surface, and a solder bump formed on the component-side pad, the surface being opposed to the substrate with each component-side pad electrode opposed to one of the substrate-side pad electrodes;

wherein the substrate-side pad electrodes are arranged inside a component-corresponding region, the length of each of the substrate-side pad electrodes being larger than that of the corresponding component-side pad electrode, and wherein each of the component-side pad electrodes is connected to the corresponding substrate-side pad electrode by a solder which has flowed between the component-side pad electrodes and the substrate-side pad electrodes by melting of the solder bump.

REMARKS

This Amendment responds to the Office Action dated January 24, 2002 in which the Examiner requested affirmation of the telephone election, objected to the drawings and rejected claims 7-8 under 35 U.S.C. §102(b).

Applicants affirm the election of claims 7-8 drawn to a connection structure as elected in a telephone election on January 15, 2002. Applicants reserve the right to file divisional applications.

Concurrently filed with this amendment is a Request for Approval of Drawing Changes in which the cross hatching is removed. It is respectfully requested that Examiner withdraws the objection to the drawings.

Claim 7 claims a connection structure comprising a substrate and surface-mounted component. The substrate has a surface and substrate-side pad electrodes formed on the substrate surface. The surface-mounted component has a surface, component-side pad electrodes formed on the surface and a solder bump formed on the component-side pad. The surface is opposed to the substrate with each component-side pad electrode opposed to one of the substrate-side pad electrodes. The substrate-side electrodes are arranged inside a component-corresponding region. The length of each of the substrate-side pad electrodes is larger than that of the corresponding component side pad electrodes. Each of the component-side pad electrodes is connected to the corresponding substrate-side pad electrodes by a solder which has flowed between the component-side pad electrodes and the substrate-side pad electrode by melting of the solder bump.

Through the structure of claimed invention having a solder bump formed on the component-side pad, as claimed in claim 7, the claimed invention provides a connection structure which is adaptable to high density mounting. The prior art does not show, teach or suggest the invention as claimed in claim 7.

Claim 7-8 were rejected under 35 U.S.C. §102(b) as being anticipated by *Tanaka* (U.S. Patent 5,889,326).

Tanaka appears to disclose a structure for bonding a semiconductor device to a substrate which is provided with: an A1 pad 2 formed on a semiconductor chip 1; a first bump 4 which is composed of a first metal such as Au and which is formed on the pad 2; a plurality of rectangular substrate pads 6 which are arranged on a circuit board 5 at predetermined pitches, and length L of a first side thereof in parallel to the arranging direction is smaller than length M of a second side thereof which is orthogonal to the first side, length L of the first side is smaller than the diameter of the first bump 4, and length M of the second side is larger than the diameter of the first bump 4; and a second bump 7 which is formed on the substrate pad 6, which melts to cover the first bump 4, and which is composed of a second metal such as eutectic Sn/Pb or other metal that is different from the first metal, the width thereof in the direction parallel to the first side being smaller than the diameter of the first bump 4 and the width thereof in the direction parallel to the second side being larger than the diameter of the first bump 4. (col. 3, lines 7-25).

Thus, *Tanaka* merely discloses a solder bump 7 formed on the substrate pad 6. Thus nothing in *Tanaka* shows, teaches or suggests a solder bump formed on the

component-side pad as claimed in claim 7. Rather, *Tanaka* clearly teaches away from the claimed invention since the solder bump 7 is formed on the substrate pad 6.

Since nothing in *Tanaka* shows, teaches or suggests a solder bump formed on the component-side pad as claimed in claim 7, it is respectfully requested that the Examiner withdraws the rejection to claim 7 under 35 U.S.C. §102(b).

Claim 8 depends from claim 7 and recites additional feature that the width of each of the component-side pad electrodes is set to be larger than the width of each of the substrate-side pad electrodes.

It is respectfully submitted that claim 8 would not have been anticipated by *Tanaka* within the meaning of 35 U.S.C. §102(b) at least for the reasons as set forth above with respect to claim 7. Therefore, it is respectfully requested that the Examiner withdraws the rejection to claim 8 under 35 U.S.C. §102(b).

The prior art of record, which is not relied upon is acknowledged. The references taken singularly or in combination do not anticipate or make obvious the claimed invention.

Thus it now appears that the application is in condition for reconsideration and allowance. Reconsideration and allowance at an early date are respectfully requested.

If for any reason Examiner feels that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicants undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed within the currently set shortened statutory period, applicants respectfully petition for an appropriate extension of time. The fees for such extension of time may be charged to our Deposit Account No. 02-4800.

In the event that any additional fees are due with this paper, please charge our Deposit Account No. 02-4800.

Respectfully submitted,

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Date: April 24, 2002